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# National Lumber Manufacturers Association

Engineering Bureau

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TECHNICAL LETTER No. 3

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## CHICAGO'S FOUR MILLION DOLLAR PIER

**New and Magnificent Recreation Resort for the Coming World's Metropolis—8,001,000 Feet of Lumber Used in Its Construction—23,000 Pieces of Piling in Foundation—Concert and Dancing Pavilion Affords Room for Thousands**

Reprint from *Lumber World Review*, May 10, 1916.

Chicago's new municipal recreation pier, which ought to be classed as one of the Seven Wonders of the World from its appointments, its vastness and its magnificence, to say nothing of its almost unlimited possibilities as a recreation resort for the citizens of Chicago in every walk of life, is now rapidly approaching completion and will, it is believed, be formally opened to the public during the latter part of June.

The LUMBER WORLD REVIEW had the pleasure of visiting the new pier a few days ago upon the invitation of Earl Van Voorst, a prominent construction engineer, who is superintendent of construction of the work for the Harbor and Subway Commission of the city, and is a brother of George Van Voorst, the well known lumberman of Union Hill, Ill. Although the pier is built largely of concrete and steel, millions of feet of lumber were used in its construction. Doubtless few people, excepting those directly concerned, have had any idea of the enormous quantities of material of all kinds used, of not only lumber, but of the other component materials.

### Dimensions of the Pier.

The pier is 3,000 feet long, extending out into the lake directly east from the foot of Grand avenue and just north of the mouth of the Chicago river. It is particularly easy of access to the general public owing to the fact that any north and south line of street cars will transfer to the Grand avenue-Lake Shore line, which runs through the interior of the structure to within about 700 feet of the lake end. It travels on the second floor of the pier, turning at the east end and having ample accommodations all the way around the interior loop, about 5,000 feet in length, for receiving and discharging passengers.

### The Exterior Features.

The two pictures of the pier to be found herewith give only a faint idea of its splendid proportions. At each end are towers 100 feet high which can be seen from almost any part of the city's 35-mile lake front, as well as for miles at sea. The towers at the lake end are ornamented with gold leaf and reflect the sun in dazzling lights at certain times of the day and are literally pillars of fire at night. On both sides of the first floor passenger steamers, running from and to the various lake ports, discharge or receive their cargoes. On the second floor along the entire length of each side of the pier, are the passenger docks, where the thousands of passengers embarking on or landing from the lake boats daily during the season are easily accommodated. On the third floor and extending clear around the building and from the land end to the lake end, on each side—making a total distance of 5,000 feet, or nearly a mile—is a 16-foot board walk for promenade. Along this sidewalk are scattered an endless number of settees for resting. The above, in a general way, comprise the exterior features of the structure.

### Piling and Plank for Foundation.

Construction of the pier was started by the city two years ago this spring. In the foundation there were driven 23,000 pieces of piling, from 40 to 60 feet long. Around the entire outer edge of the pier was driven sheet piling or heavy plank, composed of 4x14 fir and from 32 to 42 feet long, bolted together in three layers, making a solid 12-inch retaining wall. The interior of this vast foundation space was then filled in with stone and gravel and the water forced out. This piling was extended around the foundation basin for a distance of 6,600 feet, and alone required over 4,500,000 feet of fir.

#### Creosoted Blocks Used.

On the first floor of the structure, where freight for lake transportation is received or discharged, there were laid 50,000 square yards of creosoted wood block paving, 3x4x8 inches in dimension, all yellow pine. This involved 1,350,000 feet of yellow pine.

#### The Great Board Walk.

The board walk, on the top story, is composed of 3x6 fir, 20 feet long, laid lengthwise, the walk being 16 feet wide. This walk required 250,000 feet of fir for the walk proper, and for the 3x6 nailing strips, which are bolted on the steel framing. It will be a popular thoroughfare this summer.

#### Features for Public Convenience.

On the second floor, at the east end, is a mammoth restaurant, 32x250 feet. Adjoining it is a roof garden 80x300 feet, and below that is a shelter shed of the same dimensions, where thousands of people can be protected from inclement weather.

There is a large concourse room on the second floor, 50x300 feet in size. Another feature is the hospital on the first floor, where accommodations are afforded for caring for fifteen or twenty people, who may be injured or ill. It is provided with separate wards for men, women and children.

There are 80,000 panes of wire glass used in the structure, and for setting it there were required sixty-three tons, or three car loads, of putty.

#### The Great Concert Hall.

It is in the magnificent concert hall, however, where much of the interest of visitors to the municipal pier will center. This hall is semi-circular on the east end, and is lighted with a steel frame glass and copper roof, in which are installed 4,000 electric lights. The stage at the west end of the concert pavilion is 80 feet wide and 32 feet deep. The floor of the pavilion is of maple, and 26,000 feet of 2 $\frac{1}{4}$ -inch flooring were required. The interior of this handsome auditorium is being painted light grey, thus adding to the lighting effect. It will seat comfortably 4,500 people, but the wide doors surrounding it on each of the three floors may be opened, so that fully 10,000 people may listen at one time to the concerts that will be given there. This concert hall will be used also for dancing at stated times.

#### Recreation Pier at Lake End.

At the extreme east end of the pier some most attractive recreation features are to be found. At the northeast and southeast corners, respectively, are two mammoth fountains about 20 feet high, made of granite. At the northeast corner is a tower established by the United States weather bureau for observations, and also for displaying weather signals. On the southeast corner is a government lighthouse. There are a half dozen or more beautiful flag poles surmounted with golden eagles, while hundreds of tall electric high power lamps serve to illuminate every part of the recreation pier and the entire structure. Here are installed hundreds of settees for the weary visitors.

The cost of the pier is stated by the city authorities to be over \$4,000,000.

#### Estimate of Lumber Used.

A close estimate has been given of the quantity of lumber used, and the figures are as follows:

	Feet.
Board walk (Douglas fir).....	250,000
Sheet piling (Douglas fir).....	4,500,000
Bumper plank, freight dock (oak).....	25,000
Concrete forms (yellow pine).....	1,800,000
Creosoted blocks (yellow pine).....	1,350,000
Planking, trestles, etc. (sundry woods).....	50,000
Hardwood flooring (maple).....	26,000
 Total.....	 8,001,000

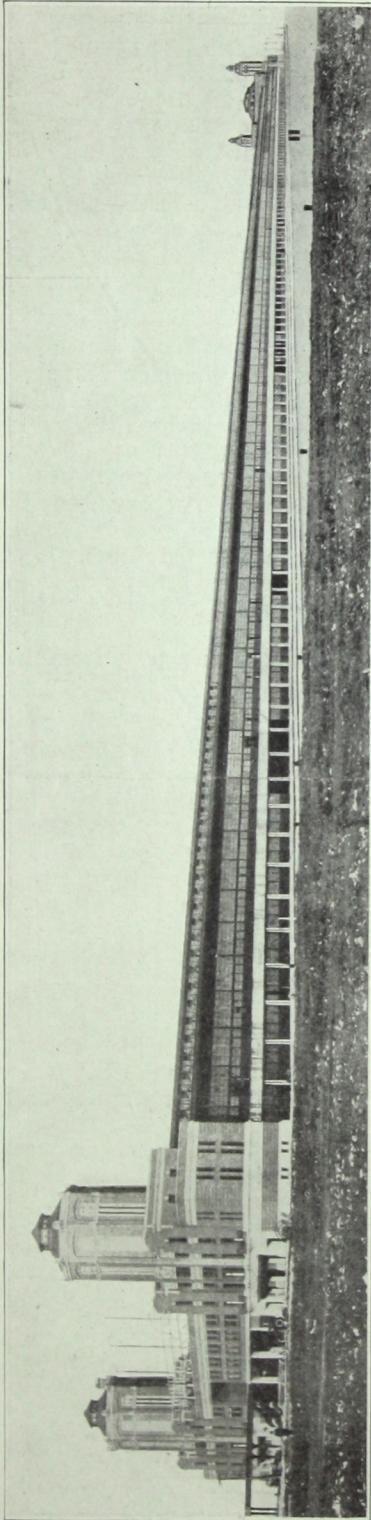
In addition there were 23,000 pieces of piling, 40 to 60 feet long, which, if reduced to board feet, would make at least 6,500,000 feet more.

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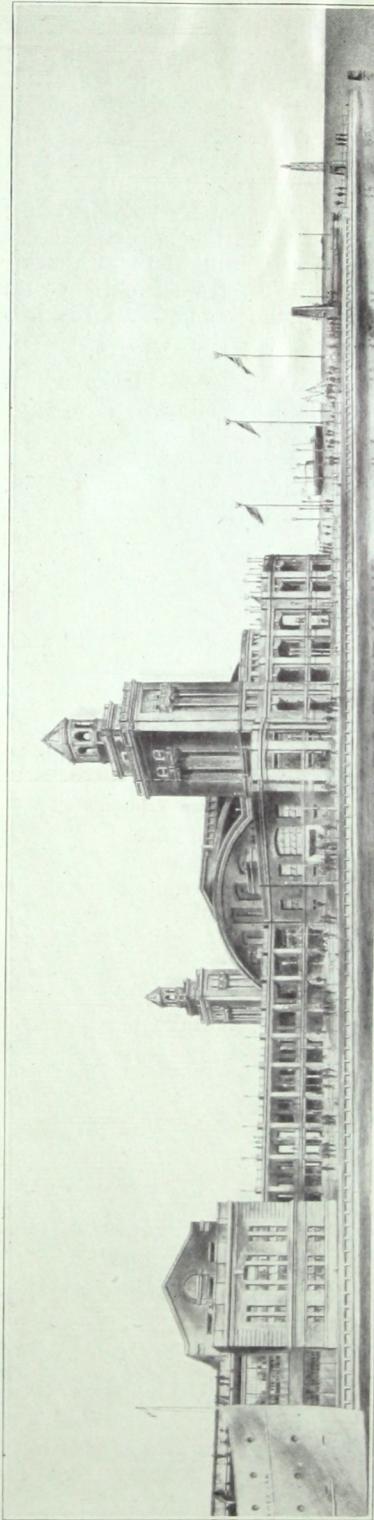
#### ADDITIONAL ENGINEERING DATA.

By C. E. Paul, Consulting Engineer.

The foregoing description does much to enlighten the visitor who is inspecting the Chicago Municipal Pier. The general impression in viewing this structure, either from the inside or the outside, is that it is one huge mass of masonry, steel shapes, and concrete slabs. The public in general does not comprehend the magnitude of the part which wood plays in the construction of



View in Perspective of the Chicago \$4,000,000 Municipal Pier Which Contains 8,001,000 Feet of Lumber and Stands on 23,000  
Pieces of Piling—One of the Most Imposing Municipal Structures in the World.



View of the East—Or Lake Michigan—End of Chicago's \$4,000,000 Pier Giving a Nearby View of the Detail of the Concert and  
Dancing Pavilion—The Greatest "Public Comfort" Structure.

an engineering feature of this type, but the architect or engineer realizes how little could have been accomplished without the use of this important material.

Wood piling has shown its value for many years in the past and will continue to be used in all instances where dependability, ease of handling, and minimum cost are to be counted on.

The value of wood in the construction of concrete forms needs no explanation. No other material can take its place in general construction where adaptability is a feature.

The use of wood block paving in this structure merely bears out the point that such paving properly laid produces a wearing surface which cannot be equalled for hard wear and ease of travel for workmen. The fact that the recreation walk on the top story is built of wood again bears out the fact that for comfort and ease in walking no other material will take the place of wood in the eyes of the public.

Timber was used in the Chicago Municipal Pier because the engineers and designers of this structure knew from experience the value of wood in the locations in which it was used. It is not an experiment, but is a result of the experience of trained men.

#### **Creosoted Wood Block Floors.**

The creosoted wood blocks which were used on the freight floor of the pier described above were laid as follows: The base or supporting floor consists of a reinforced concrete slab 10 inches thick held in place by concrete girders and piers. A sand cushion 1 inch thick was placed on the concrete and the 3-inch by 4-inch by 8-inch blocks laid on the sand with the 3-inch dimension vertical. The blocks were placed with the long dimension parallel to the length of the pier so that the trucking will be in a direction across the width of the blocks. A space about  $\frac{1}{8}$  inch in width was left between blocks and later filled with pitch.

Expansion joints 1 inch in width were provided in each direction across the floors. One series of joints are spaced 60 feet apart lengthwise of the pier, while another series extend in a direction parallel to the length of the structure and are spaced 25 feet apart across the width. A joint is left at the concrete rail on each side of the floor.

At the concrete posts which pierce the floors, the blocks were kept  $1\frac{1}{2}$  inches away from the posts and the surrounding spaces filled with pitch.

#### **Method of Laying Board Walk.**

As stated above, the board walk is composed of 3-inch by 6-inch fir planks laid flat and nailed to 3-inch by 8-inch nailing strips bolted to the steel I-beams which form a part of the framework of the structure. These I-beams are spaced 6 feet 8 inches on centers. The planks are in lengths of 6 feet 8 inches, 13 feet 4 inches, and 20 feet. They are spaced  $\frac{3}{8}$  inch apart and break joints in such a manner that each fourth piece across the walk ends at the same nailing strip. This allows two pieces to rest on a given nailing strip without a joint occurring, but the pieces on either side of these two will break at the same strip. By this method, one-third of the total number of joints occur at each support along the length of the walk.

The nailing strips are placed with the 3-inch dimension vertical and fastened to the steel by means of  $\frac{5}{8}$ -inch diameter bolts with the heads countersunk into the wood.

#### **Oak Bumpers at Freight Doors and Docks.**

The oak bumpers referred to in the estimate of lumber are heavy timbers which extend along the outside of the freight shed on a line just below the doors, and also around the outer sides of the dock in the form of walings. These outer walings prevent a steamer from contact with the concrete when moored to the pier.

The bumpers for teams are fastened to the face of the concrete by  $1\frac{1}{4}$ -inch diameter steel bolts 15 inches long, screwed into cast iron sockets which are embedded in the concrete. Bolts and cast iron sockets are used also to hold the outer walings against the face of the dock.

The timber for the outer walings was given preservative treatment before it was placed in the concrete.

#### **Addition to Estimate Given Above.**

The estimate given at the close of the description above may be increased by considering the timber used in the construction of the extension of the tracks for street car service. About 4,500 yellow pine ties 8 inches by 8 inches in section and 7 feet long were used, together with about 26,000 linear feet of 6-inch by 8-inch yellow pine guard or safety rail bolted to the ends of the ties.

The new breakwater which is to be constructed as a protection to the pier will be 2,000 feet long and will require a wall of the 4-inch by 14-inch fir sheet piling of a construction similar to that described in the article above in addition to a large amount of ordinary piling.

The Chicago Municipal Pier was built under the direction of the Harbor & Subway Commission of the City of Chicago. Mr. E. C. Shankland is Chairman of this Commission and was Chief Engineer in charge of the design and construction of the pier.